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U.S. Department of Energy
Idaho Operations Office

Engineering Evaluation/Cost Analysis for Phase 1 of the Decommissioning for the Power Burst Facility Reactor Building (PER-620)

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Engineering Evaluation/Cost Analysis for Phase 1 of the Decommissioning for the Power Burst Facility Reactor Building (PER-620)

December 2004

Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This Engineering Evaluation/Cost Analysis is being prepared for public comment. In addition, this Engineering Evaluation/Cost Analysis assists the U.S. Department of Energy Idaho Operations Office in identifying the proposed first phase for decommissioning the Power Burst Facility reactor building (PER-620). The action will be performed as a non-time-critical removal action. It is intended to satisfy environmental review requirements while providing a framework for selecting the decommissioning approach and satisfying Administrative Record requirements for documentation of the removal action.

EXECUTIVE SUMMARY

The Power Burst Facility (PBF) reactor operated from 1972–1985 to conduct tests of reactor fuel in extreme environments. The nuclear fuel was removed in 2003 and actions related to potential hazardous waste covered in the Voluntary Consent Order have been completed. The U.S. Department of Energy Idaho Operations Office (DOE-ID) is currently completing deactivation of the facility.

This Engineering Evaluation/Cost Analysis (EE/CA) considers two alternatives for the first phase of the decontamination and decommissioning of PBF at the Idaho National Engineering and Environmental Laboratory (INEEL). Alternative 1 (No Action) is to take no action at this time, while Alternative 2 consists of material removal activities and performing work that will prepare the facility for subsequent final decommissioning activities.

The decommissioning of PER-620 is being conducted in two phases, because the INEEL is in the process of transitioning into separate cleanup and research programs to be known as the Idaho Completion Project (ICP) and Idaho National Laboratory (INL), respectively. The separation of these programs is scheduled for completion on May 1, 2005.

This first phase of the PER-620 decommissioning will address those activities that may be completed prior to the scheduled contract end date for the ICP and will allow cleanup activities to continue while the transition is completed. These actions would reduce overall surveillance and maintenance costs at the facility. This EE/CA has been prepared for public comment.

Decommissioning work to be accomplished during Phase 1 includes the following:

- Removing and dispositioning low-level radioactive liquids from PER-620
- Removing and dispositioning liquids in the PER-706 evaporation tank
- Removing and dispositioning most of the shielding lead and all cadmium sheeting
- Removing and dispositioning the inpile tube
- Installing shielding over the reactor following removal of the reactor vessel water (alternatively, the reactor vessel may be filled with an inert, solid shielding material)
- Removing and disposing of some radioactive hotspots may also be necessary to reduce worker exposures during removal of shielding lead
- Isolating utility lines and other piping to the PBF reactor building and weatherproofing the building
- Other waste generated incidental to accomplishing this scope would be managed as Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste (e.g., personal protective equipment, decommissioning equipment, and any potential contaminated soil encountered).

Phase 2 final decommissioning activities of PER-620 are expected to be complete by the end of 2012. These activities are expected to occur under a subsequent action that will also provide opportunity for stakeholder involvement. None of the proposed Phase 1 activities would impact or reduce the full range of options for the ultimate disposition of PER-620 during Phase 2.

Under CERCLA (42 USC § 9601 et seq.), a removal action may be taken to abate, prevent, minimize, stabilize, mitigate, or reduce the threat of release of hazardous substances. For non-time-critical removal actions, preparation of an EE/CA is required under 40 *Code of Federal Regulations* (CFR) 300.415(b)(4)(i) of the "National Oil and Hazardous Substances Pollution Contingency Plan." Although the PBF reactor was not specifically addressed in the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000), the actions to be undertaken by this non-time-critical removal action are consistent with the remedial action objectives for soil sites and the future land use assumptions in the Record of Decision. It is also consistent with past actions taken on other reactor facilities in the PBF area.

Alternative 2, material removal activities and performing work that will prepare the facility for subsequent final decommissioning activities, is the preferred alternative. This alternative recommends disposal of the low-level radioactive liquids that originated from PER-620 in the evaporation ponds at the INEEL CERCLA Disposal Facility (ICDF). Alternatively, sufficient capacity exists in the PER-706 evaporation tank to allow the liquids to evaporate in the tank. The inpile tube would be packaged in a fabricated shielding container and disposed of at the ICDF or an appropriate off-INEEL disposal facility, such as the Radioactive Waste Management Site at the Nevada Test Site. Removed lead that cannot be recycled or reclaimed shall be declared a hazardous waste or mixed low-level waste and will be disposed of at an appropriate off-INEEL Resource Conservation and Recovery Act (RCRA) disposal facility, such as Envirocare of Utah. Likewise, the cadmium sheeting will be disposed of at an off-INEEL facility. The lead and cadmium will be stored in RCRA compliant storage prior to disposal. Any other non-Hazardous Waste Management Act (HWMA)/RCRA waste generated incidental to completing the scope of Alternative 2 that is not otherwise designated for a specific disposal facility in this document will be disposed of in accordance with prevailing waste acceptance criteria for on-INEEL or off-INEEL facilities.

The recommended alternative meets the proposed removal action objectives regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, and provides a safe and stable configuration that is environmentally sound. The alternative may be implemented prior to the ICP contract end date and allows the DOE-ID to continue making efficient progress toward the completion of closure actions at the PBF area site and remediation of Waste Area Group 5, which will allow the ICP and INL to focus on other cleanup, closure, and new mission activities.

This EE/CA will become part of the INEEL Administrative Record. It will be made available for public comment. The INEEL Administrative Record is on the Internet at http://ar.inel.gov/ and is available to the public at the following locations:

Albertsons Library
Boise State University
1910 University Drive
Boise, ID 83725
(208) 426-1625

INEEL Technical Library
DOE Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83415
(208) 526-1185

CONTENTS

FIGURES

TABLES

ACRONYMS

ALARA	as low as reasonably achievable
ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	*Code of Federal Regulations*
DEQ	[Idaho] Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	engineering design file
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
ICP	Idaho Completion Project (will become known as Idaho Cleanup Project after May 2005)
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
INL	Idaho National Laboratory
IPT	inpile tube
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RWMC	Radioactive Waste Management Complex
SPERT	Special Power Excursion Reactor Test

TBC	to be considered
TSCA	Toxic Substances Control Act
USC	*United States Code*
VCO	Voluntary Consent Order
WERF	Waste Experimental Reduction Facility
WROC	Waste Reduction Operations Complex

Engineering Evaluation/Cost Analysis for Phase 1 of the Decommissioning for the Power Burst Facility Reactor Building (PER-620)

1. INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA)—prepared in accordance with Section 300.415(b)(4)(i) of the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) assists the U.S. Department of Energy Idaho Operations Office (DOE-ID) in identifying the proposed first phase for decommissioning the Power Burst Facility (PBF) reactor building (PER-620). The action will be performed as a non-time-critical removal action. It is intended to satisfy environmental review requirements while providing a framework for selecting the decommissioning approach and satisfying Administrative Record requirements for documentation of the removal action. This EE/CA identifies the objectives of the removal action and analyzes the effectiveness, implementability, and estimated cost of the proposed action to satisfy these objectives.

Reactor fuel was removed from the facility in 2003. Efforts have been completed to remove other nonnuclear and nuclear facilities and structures in the PBF Complex. Other activities have also been completed—and others are underway or planned—to remove remaining nonradioactive and radioactive water, materials, and debris from the PBF Complex area and PER-620 in advance of decontamination and decommissioning of the PER-620 PBF reactor building. Efforts have been completed to characterize the contents of the facility. The DOE-ID has chosen to move forward with the first phase of decontamination and decommissioning of the PBF reactor building through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.) non-time-critical removal action process.

The decommissioning of PER-620 is being conducted in two phases. The Idaho National Engineering and Environmental Laboratory (INEEL) is in the process of transitioning into separate cleanup and research programs to be known as the Idaho Completion Project (ICP) and Idaho National Laboratory (INL), respectively. The separation of these programs is scheduled for completion on May 1, 2005. This first phase of the PER-620 decommissioning will address those activities that may be completed prior to the scheduled contract end date for the ICP and will allow cleanup activities to continue while the transition is completed.

Currently at PER-620, radioactive materials and heavy metals comprise the inventory of contaminants of concern. The reactor vessel contains contaminated water that provides shielding for the irradiated components inside the vessel. Contaminated water is also present in the piping for the primary coolant system. Residual fission product material, activated metals, and radioactive surface contamination are in many areas of the facility. The facility also contains elemental lead installed to provide shielding from ionizing radiation. The non-time-critical removal action would place the facility in a configuration that remains protective of human health and the environment and will prepare the facility for subsequent final decommissioning activities. This action is consistent with the joint U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* report (DOE and EPA 1995), which establishes the CERCLA non-time critical removal action process as an approach for decommissioning.

This document provides the information necessary to show that without decommissioning of PER-620, a potential threat of release of hazardous substances exists, and without action, adverse threats to human health and the environment eventually could occur. Two alternatives are presented so that a decision can be made as to the appropriate action necessary to mitigate the potential release of hazardous substances from the PER-620 facility. As the lead agency, DOE has determined that a removal action is appropriate. Both the Idaho Department of Environmental Quality (DEQ) and the EPA concur that a non-time-critical removal action is warranted to protect human health and the environment. Through the non-time-critical removal action process, the risks presented in this document will be mitigated in a timely manner.

2. SITE CHARACTERIZATION

This section provides summary background information and a description of the PER-620 reactor building, identifies previous and ongoing closure and cleanup activities, and provides a summary of the completed radiological and nonradiological characterization of the building.

2.1 Site Description and Background

2.1.1 Idaho National Engineering and Environmental Laboratory

The INEEL, managed by DOE, is located 51 km (32 mi) west of Idaho Falls, Idaho. The INEEL occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain. In 1949, the U.S. Atomic Energy Commission established the INEEL, which was called the National Reactor Testing Station at that time. Its purpose was to conduct nuclear energy research and related activities. It was re-designated the Idaho National Engineering Laboratory in 1974 and then the INEEL in 1997 to reflect expansion of its mission to include a broader range of engineering and environmental management activities.

The DOE-ID controls all land within the INEEL, and public access is restricted to public highways, DOE-ID-sponsored tours, special-use permits, and the Experimental Breeder Reactor I National Historic Landmark. In addition, DOE-ID accommodates Shoshone-Bannock tribal members' need for access to areas on the INEEL for cultural and religious purposes.

The INEEL is located primarily in Butte County; however, it also occupies portions of Bingham, Bonneville, Clark, and Jefferson counties. The 2000 census indicated the following populations (in parentheses) for cities in the region: Idaho Falls (50,730), Pocatello (51,466), Blackfoot (10,419), Arco (1,026), and Atomic City (25).

Surface water flows on the INEEL consist mainly of three streams draining intermountain valleys to the north and northwest of the INEEL Site: (1) the Big Lost River, (2) the Little Lost River, and (3) Birch Creek. All of the channels terminate on the INEEL. Flows from Birch Creek and the Little Lost River seldom reach the INEEL because of irrigation withdrawals upstream. The Big Lost River and Birch Creek may flow onto the INEEL before the irrigation season or during high water years, but the terminal reaches are usually dry. In those few wetter years when the Big Lost River carries water to the end of its channel, the water sinks into the ground.

The physical characteristics, climate, flora and fauna, demography, and cultural resources of the INEEL and PBF area are described in the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000).

2.1.2 Power Burst Facility Area

Once known as the Special Power Excursion Reactor Test (SPERT) facilities, the PBF area (Figure 1) consists of five separate operational areas: (1) the PBF control area, (2) the PBF reactor area (SPERT-I), (3) the Waste Engineering Development Facility (SPERT-II), (4) the Waste Experimental Reduction Facility (WERF) (SPERT-III), and (5) the Mixed Waste Storage Facility (SPERT-IV). Collectively, the WERF, Waste Engineering Development Facility, and the Mixed Waste Storage Facility were known as the Waste Reduction Operations Complex (WROC). It is located in the south-central region of the INEEL, approximately 9 mi east of the Central Facilities Area (CFA). At the PBF reactor area, the SPERT-I reactor was operated from 1955 to 1964. It was decommissioned in 1964 and demolished in 1985. The PBF reactor was constructed in 1972 just north of the remains of the old SPERT-I facility.

2.1.3 Power Burst Facility Reactor Facility

The PBF reactor operated from 1972 to 1985. Other structures in the vicinity include a maintenance and storage building, two electrical substations, and numerous smaller buildings and structures. Figure 2 shows the general layout of the PBF part of the WERF/WROC/PBF Complex. This EE/CA addresses only the PBF reactor building (PER-620) and the PER-706 evaporation tank liquids at the PBF reactor area (formerly SPERT-I). Figures 3 and 5 show PER-620 in the plan and elevation views.

The PBF reactor building houses the reactor vessel, fuel storage canal, and various process systems that supported reactor operations. The structure is a two-story, steel-framed building that has steel plate interior with aluminum exterior siding and two block-wall wings (east and west). The building is divided into a main reactor high-bay room, two single-story wings containing instrumentation and electrical control equipment, various support offices, operational and utility areas, and a two-level basement.

The main floor of the building contains the high bay; offices for the shift supervisor, operator training, and radiological control technicians; a decontamination room; a counting room; personal protective equipment (PPE) issue room; a tool crib; bathrooms; and change rooms. The high bay contains the canal (which joins the reactor on the south side), a 1-ton jib crane, and a 15-ton bridge crane. The high bay’s floor has hatches giving access to Loop Cubicles 10 and 13 on the level below. These cubicles contain nearly all the shielding lead in the building. Additional support and operational areas include the process control room and the furnace and equipment room. The east wing of the main floor contains the mechanical work area, test loop control room, the experimental instrumentation room, and an electronic work area.

The building has two basement levels, which are connected by a stairwell and floor hatches. The first basement level contains part of the reactor vessel enclosure, Loop Cubicles 10 and 13, process and utility equipment, the experimental loop pipe access tunnel, and a sampling area. The second basement level contains the loop knockout drum room, subpile room, warm waste and hot waste room, poison injection system room, additional process and utility equipment, and the waste gas exhaust room.

Figure 3 depicts the subfloor chambers shown at the left or on the north side of the basement. The loop cubicle represents three chambers, one behind another. In this view, Cubicle 10 is closest to the viewer. The main function of this chamber was processing the experimental loop coolant. The sampling room is behind it, and, easternmost, Cubicle 13 is behind the sampling room, which housed the blowdown tank among other functions. Figure 4 shows Cubicles 10 and 13 in plan view.

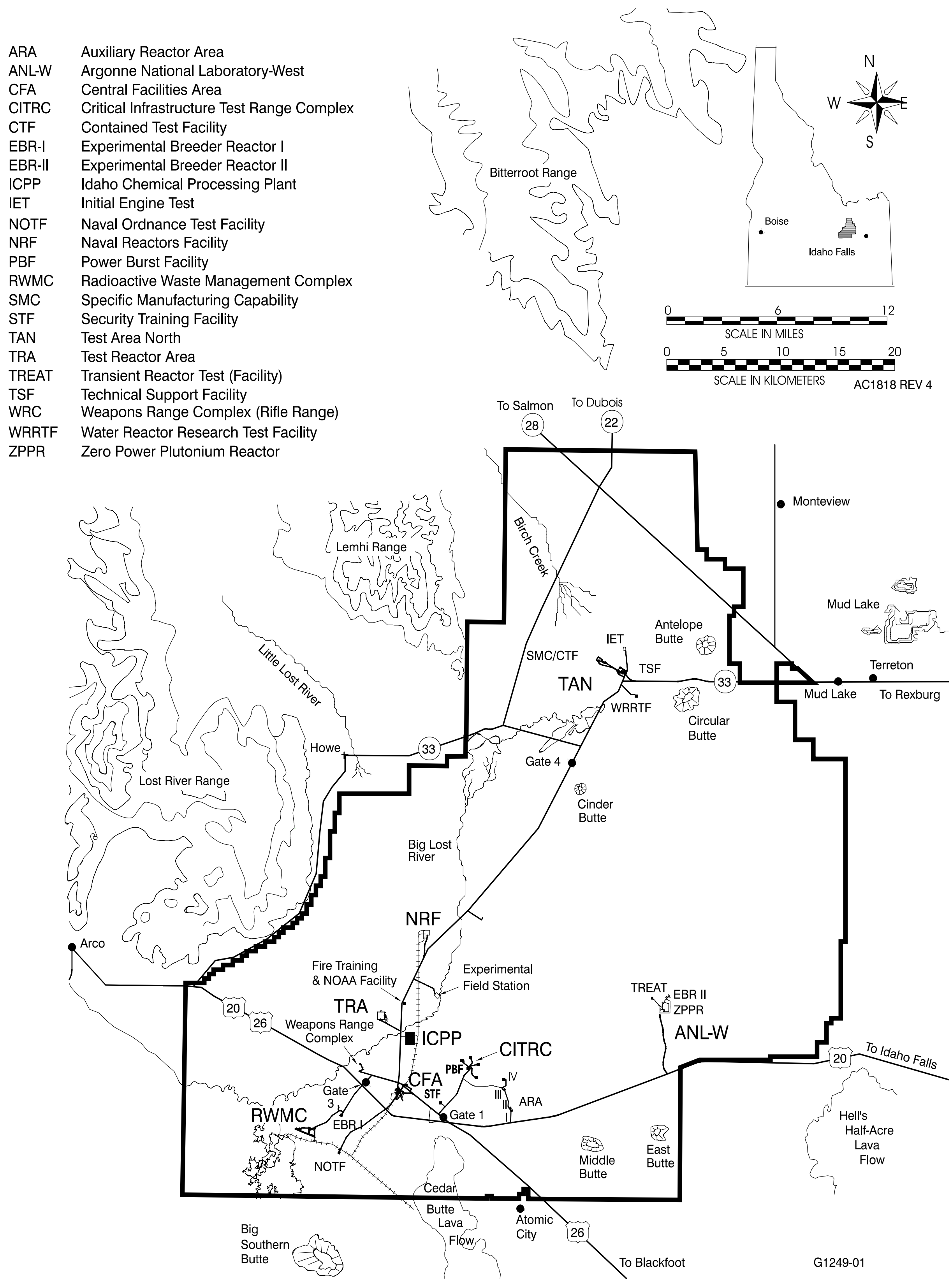

Figure 1. Location of the Power Burst Facility reactor area on the Idaho National Engineering and Environmental Laboratory Site.

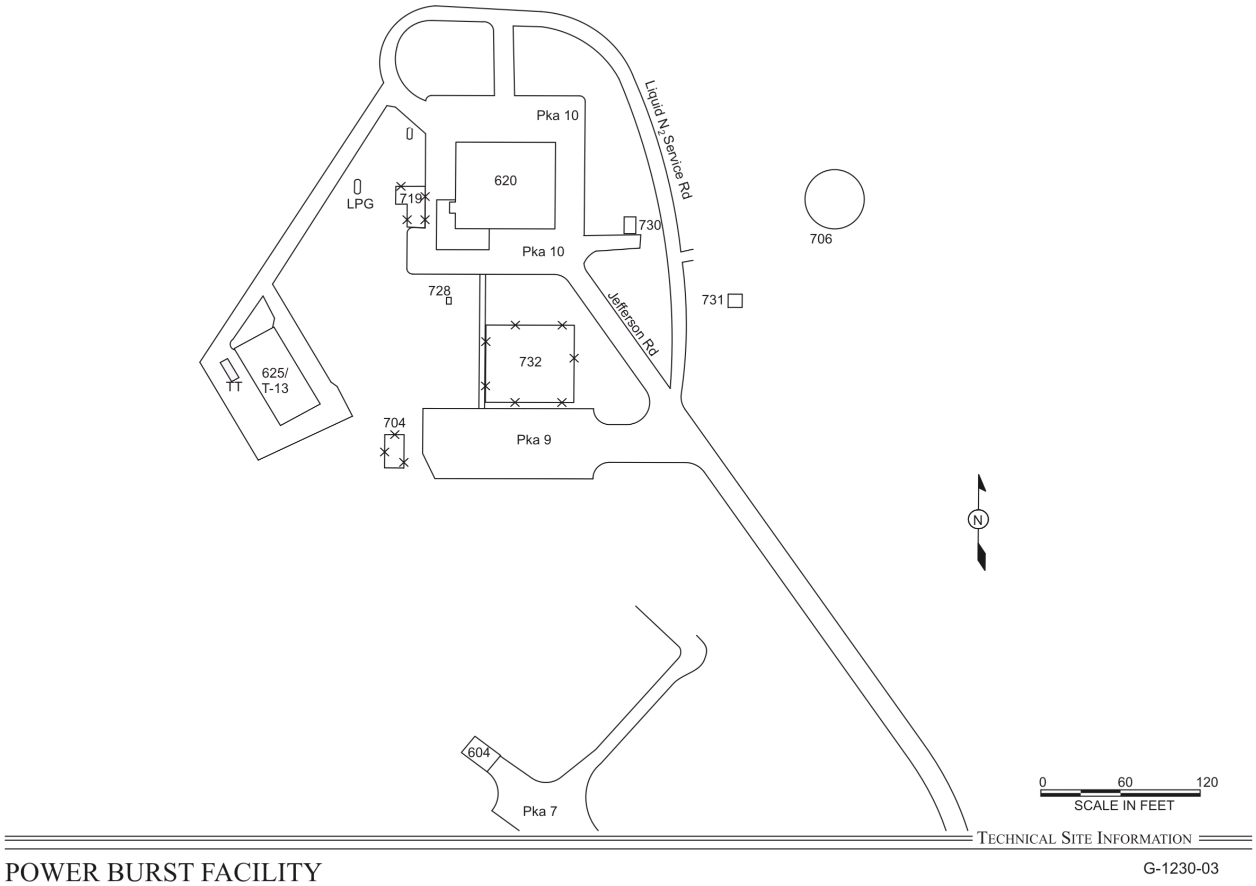

Figure 2. General layout of the Power Burst Facility part of the Waste Experimental Reduction Facility/Waste Reduction Operations Complex/Power Burst Facility area.

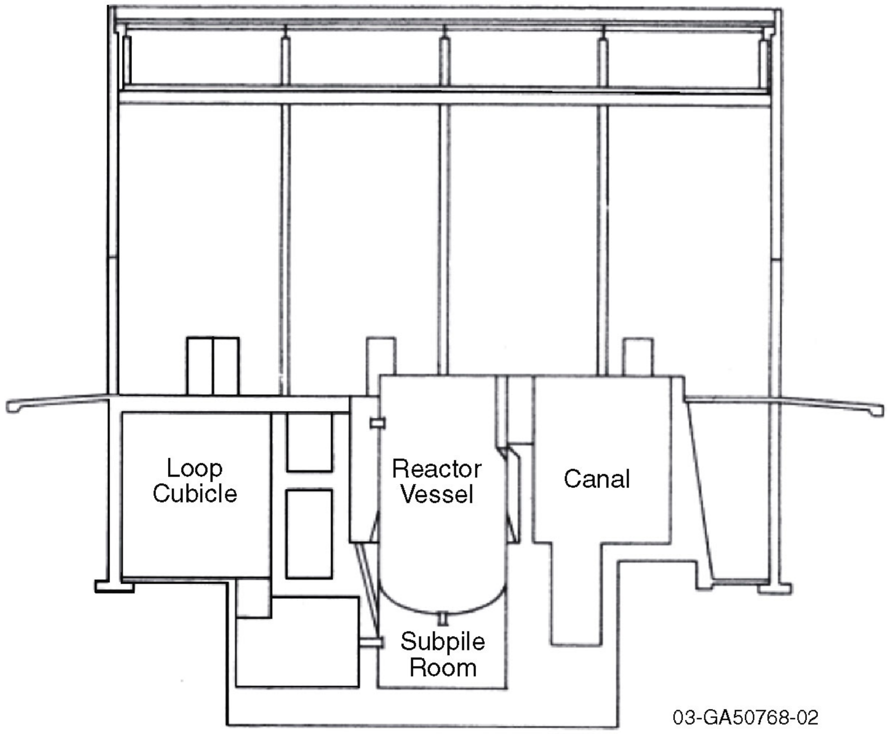

Figure 3. Power Burst Facility reactor building (PER-620) elevation looking east.

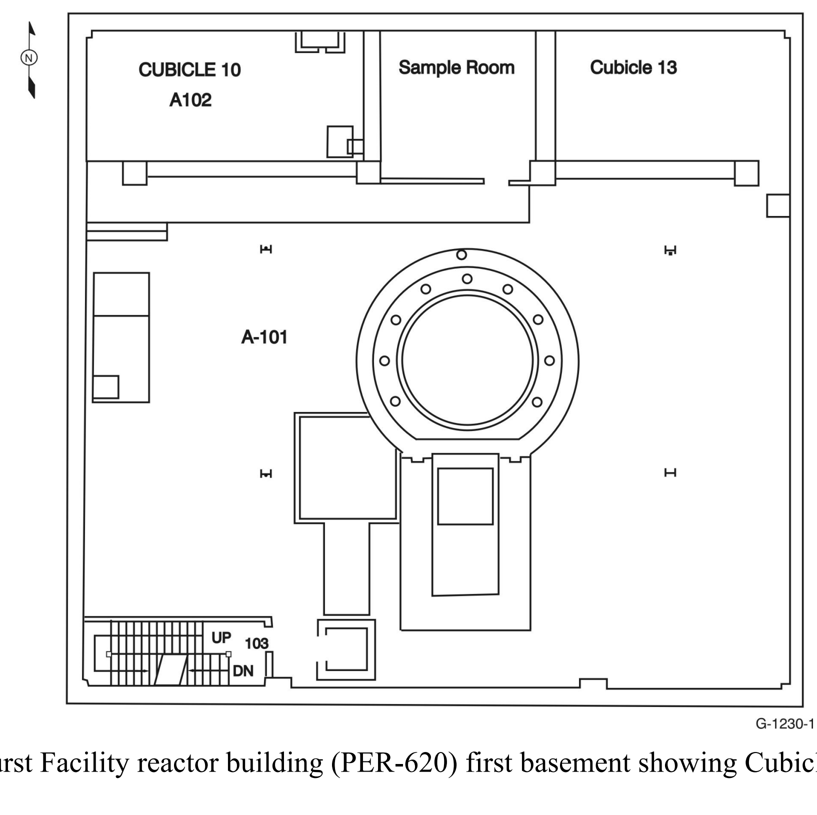

Figure 4. Power Burst Facility reactor building (PER-620) first basement showing Cubicles 10 and 13.

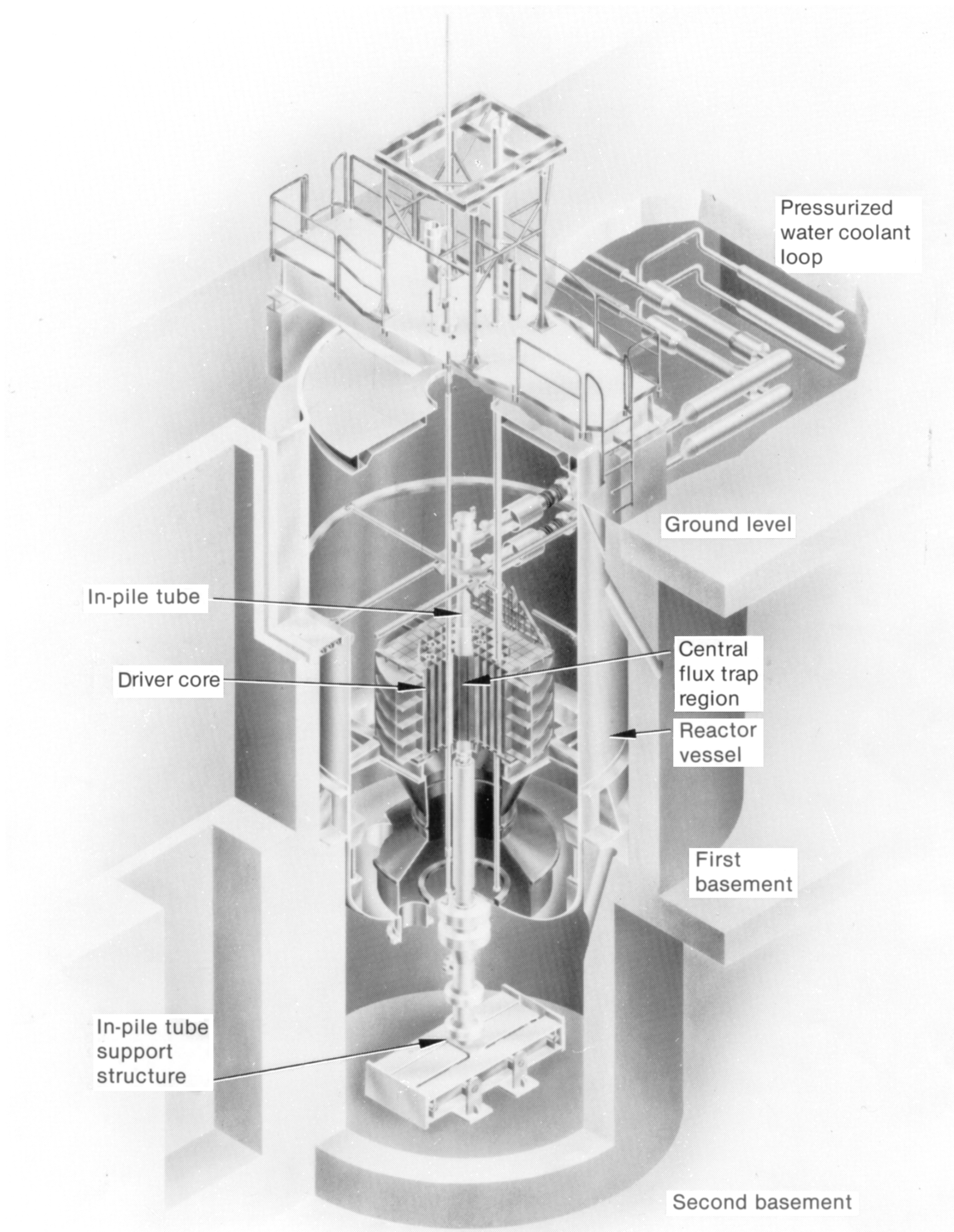

Figure 5. Power Burst Facility reactor sectional view.

Figure 5 shows an artist's rendering of the PBF reactor in sectional view. The reactor core is located centrally in a stainless-steel reactor vessel, which was filled with water. Experiments were contained in an Inconel 718 inpile tube (IPT) that occupied the central flux trap of the core and extended well above and below the core. The experimental test trains, after their use in the PBF core, were first held in the PBF canal and subsequently moved to the canal of the Materials Test Reactor and then to the Radioactive Waste Management Complex (RWMC) for disposal.

The testing environment for the IPT was provided by the pressurized water coolant loop. The reactor core had an overall diameter of 1.32 m (52 in.), and it was 91 cm (36 in.) high. It contained 2,392 fuel rods and 104 shim rods. The fuel was enriched UO_2 (~18.5% U-235) diluted with calcium oxide-stabilized zirconium oxide and clad with Type 304L stainless steel. Fuel rods were surrounded by a row of solid stainless-steel reflector rods and water. There were eight B_4C (boron carbide) control rods and four transient rods of similar construction used to control criticality and flux transients. The PBF fuel rods were removed in the summer of 2003.

2.2 Previous Closure/Cleanup Activities at the Power Burst Facility

The *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000) selected a remedy for the cleanup of identified contaminated soil at PBF and the Auxiliary Reactor Area (ARA). Remedies also were selected for a radionuclide tank and a sanitary waste system at ARA. All remedial actions have been completed at PBF/ARA and, as required under CERCLA (42 USC § 9601 et seq.) whenever waste is left in place, institutional controls have been implemented for residual contaminants left in place at concentrations that would not allow for unrestricted use or access. Figure 6 shows the locations of current and planned institutionally controlled areas at PBF/ARA.

Near PER-620, long-term institutional controls are currently maintained for the following sites:

- ARA-06 (SL-1 burial ground)
- ARA-07 (ARA-II seepage pit east)
- ARA-08 (ARA-II seepage pit west)
- ARA-24 (ARA-III windblown soil)
- ARA-25 (soil beneath ARA-626 hot cells)
- PBF-10 (PBF reactor evaporation pond)
- PBF-12 (SPERT-I leach pond)
- PBF-13 (PBF area rubble pit)
- PBF-21 (SPERT-III large leach pond)
- PBF-22 (SPERT-IV leach pond)
- PBF-26 (SPERT-IV lake).

At the SL-1 burial grounds, radioactively contaminated debris from a steam explosion at the reactor and approximately 76.5 m^3 (1,910,000 lb) of lead were disposed of between 1961 and 1962 (DOE-ID 1999). A permanent, intrusion-resistant engineered cover is present for the SL-1 burial ground (ARA-06), since the buried debris would require isolation for a minimum of 400 years. The proposed non-time-critical removal action for the first phase of PER-620 decommissioning would be consistent with the remedial action objectives for soil sites and the future land use assumptions in the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000).

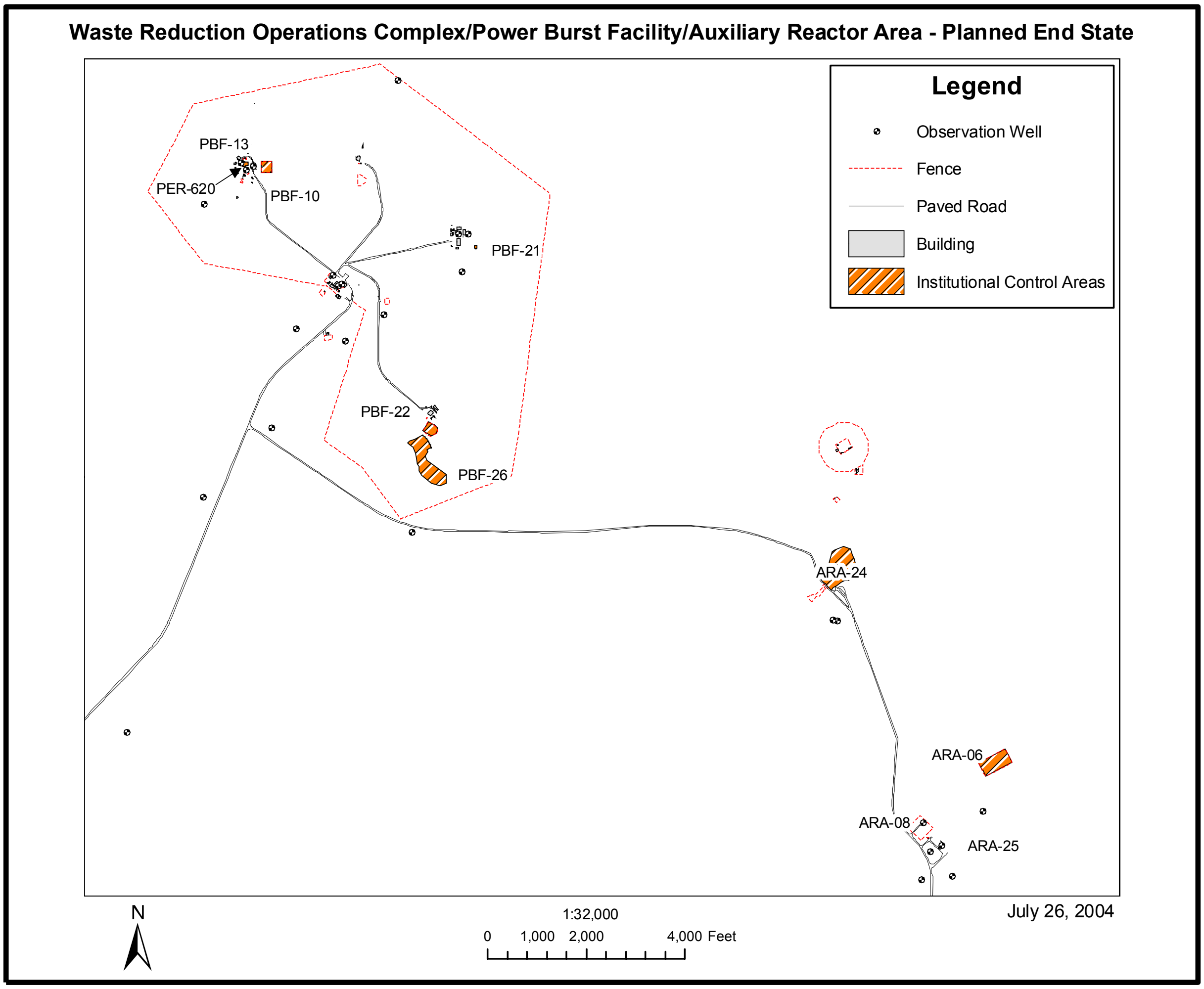

Figure 6. Locations of current and planned institutionally controlled areas at the Power Burst Facility/Auxiliary Reactor Area.

In June 2002, during routine gauging of an underground heating fuel storage tank located adjacent to the PBF reactor building, a decrease in the product level suggested that the tank (PER-722) might have released fuel to the subsurface. Further investigation confirmed that heating oil was released from the tank to the subsurface. The remaining heating fuel product was removed from the tank, but the tank remains in place. Characterization studies, including the installation of borings and a monitoring well completed in the Snake River Plain Aquifer, demonstrated that the aquifer is not impacted by the release (EDF-4697). The empty tank has been filled with grout. The DEQ is requiring groundwater monitoring for a minimum of 3 years.

In September 2004, the INEEL completed actions at PER-620 under the Voluntary Consent Order (VCO) between DOE and DEQ for the NEW-PBF-001 Action Plan. The INEEL has characterized a total of 44 items that were considered as potential Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA) waste at the time the VCO was signed. Some 38 of the 44 items were then analyzed and characterized as nonhazardous. Materials that were removed under the VCO Program include approximately 38,000 lb of lead; two panel-mounted, air-conditioning units; and oil from two pump systems. The additional shielding lead and 147 lb of cadmium sheeting associated with the Fission

Product Detection System located in Cubicle 13 are the only materials that would be generated under the alternatives for this removal action that would require management in accordance with HWMA/RCRA.

The PBF reactor was placed on operational standby in 1985. The PBF fuel rods were removed in the summer of 2003. Deactivation of the PER-620 canal began in October 2003. Canal Deactivation Project activities consisted of removing materials and equipment from the fuel storage canal and placing the canal in a stable, low-risk condition. Deactivation included the removal of activated fuel canisters, activated stainless-steel shim and reflector rods, aluminum filler rods, fuel rod storage racks, ion and fission chambers, a seismic support system for racks, fixed equipment, a plutonium-beryllium reactor startup source, canal water, corrosion coupons, sediment, and debris. All liquid-bearing systems were isolated. Divers were placed into the canal to seal weld the canal gate into place to isolate the reactor from the canal. In addition to installing the canal gate, the divers removed and cleaned loose contamination from the walls and floor of the canal and applied a fixative to the canal walls and floors. The water was cleaned by filtering and was pumped out to the PER-706 evaporation tank. Canal Deactivation Project activities were completed in August 2004.

2.3 Current Closure/Cleanup Activities at the Power Burst Facility

The following sections describe cleanup and closure activities currently underway in the PER-620 buildings. These activities are outside the scope of this EE/CA and are expected to be completed prior to issuance of an action memorandum for the first phase of decommissioning for PER-620. The sources were not included in the inventory for risk analysis. These activities do not impact the alternatives presented in the report.

2.3.1 Initial Decommissioning Activities

Initial decommissioning activities are other preparations for decommissioning PER-620 that are already underway to support and facilitate the first phase of decommissioning PER-620. These activities include:

1. Removal of debris throughout the PBF reactor building (PER-620). Debris is defined as low-level and nonradioactive materials that include, but are not limited to, the following: tools, equipment, buckets, glassware, gas cylinders, books/manuals, and other items to be disposed of as low-level waste, industrial waste, or excess.

2. Removal of recyclable and hazardous materials in preparation for final disposition of PER-620. Hazardous materials include acids, bases, some metals (i.e., lead and silver containing electrical components), polychlorinated biphenyl (PCB) -containing capacitors and ballasts, fluorescent bulbs, and other equipment and materials discovered.

3. Removal of systems and components from various aboveground rooms of PER-620. This activity includes draining or emptying systems containing liquids and removing electrical cabinets, hoods, sinks, mixing tanks, and counters.

2.4 Extent of Contamination and Remaining Inventories

There are no known releases of contaminants from the PBF reactor building to the underlying soil. Known releases from associated systems have been evaluated and/or remediated, as necessary. The only known releases to the soil beneath PER-620 are the aforementioned petroleum release from an underground storage tank (PER-722) located adjacent to the PBF reactor building and releases from the warm waste and corrosive waste injection wells, previously addressed in the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991). Groundwater monitoring and institutional controls are the only remaining required actions related to these releases.

Evaluations of the inventories are presented in Engineering Design File (EDF) -4697, "Radiological Characterization of the PBF Reactor for Disposal," for radionuclides and EDF-4943, "Nonradiological Inventory of Materials and Components in Subgrade Basement Levels/Areas of the Power Burst Facility Reactor Building (PER-620)," for nonradionuclides. These inventories were used to support EDF-4869, "Groundwater Pathway Risk Assessment for the PBF Closure." A summary of the results of these EDFs, as well as summary tables for the inventories, is presented in Sections 2.4.1 and 2.4.2.

2.4.1 Radioactive Wastewater

Radioactive wastewater comprises one of the low-level waste streams at the PBF reactor facility. The cumulative volume of radioactive wastewater, estimated at 77,000 gal, resulted from the commingling of predominantly radioactive water with smaller volumes of nonradioactive water. Under the initial decommissioning activities currently underway, liquids in PER-620 may be transferred to, and consolidated within, the PER-706 evaporation tank. The primary sources of the radioactive wastewater are primary coolant water (including canal water), loop coolant water, and high-pressure demineralized water. Nonradioactive sources include secondary coolant water, demineralized water, and makeup water for the PBF boiler.

2.4.2 Remaining Radionuclide Inventory

The evaluation of the PBF reactor building (PER-620) for activities of selected radionuclides is described in EDF-4697. The analysis considered activated structures remaining in the reactor vessel; the contents of tanks and piping systems within the facility; surface contamination on the floors, walls, and ceilings of the contaminated building rooms; and selected other components. Since all contaminated liquids will be removed from PER-620, and they do not need to be assessed for residual risk, EDF-4697 does not include the inventory for low-level radioactively contaminated liquids present in the reactor vessel, the primary coolant loop, or the PER-706 evaporation tank. The estimated radioactive inventory following removal of the liquids is shown in Table 1.

In EDF-4697, it was concluded that the overall activity in PER-620 is approximately 106 Ci, consisting of:

- 78 Ci embedded in activated structures, the IPT, and reactor vessel
- 17 Ci in tanks and piping systems, including the resin beds
- 11 Ci on exposed surfaces of the various rooms and cubicles.

The level of uncertainty in this analysis was estimated in EDF-4697 at approximately 50%. None of the materials would be classified as transuranic waste. The 50% uncertainty of the radiological inventory is based on a combination of factors. These factors include detector measurement accuracy, surface area and volume estimates, alloy composition uncertainty, and analysis code uncertainty.

Table 1. Summary of radioisotope contributions from all sources in the Power Burst Facility (in Curies [Ci]).

Isotope	Core Internals	Piping and Tanks—Internal	Piping and Tanks—External	Building and Cubicle Walls—Total	Cubicle 10 Resin Beds	Cubicle 10 Hotspots	Cubicle 13 Hotspots	Second Basement Resin Bed Pair	Hot/Warm Waste Room Resin Bed	All Sources (Total)
H-3	9.02E-01	—	—	—	0.00E+00	—	—	0.00E+00	0.00E+00	9.02E-01
Be-10	3.90E-06	—	—	—	8.04E-11	—	—	2.97E-11	1.01E-11	3.90E-06
C-14	1.26E-02	—	—	—	6.74E-09	—	—	1.45E-07	4.92E-08	1.26E-02
Cl-36	2.65E-04	—	—	—	0.00E+00	—	—	2.63E-09	8.94E-10	2.65E-04
Mn-54	1.28E-05	—	—	—	0.00E+00	—	—	1.12E-09	3.82E-10	1.28E-05
Ni-59	4.74E-01	—	—	—	0.00E+00	—	—	8.86E-07	3.01E-07	4.74E-01
Co-60	2.64E+01	—	—	—	0.00E+00	—	—	3.40E-04	1.16E-04	2.64E+01
Ni-63	5.00E+01	—	—	—	0.00E+00	—	—	2.50E-02	8.50E-03	5.00E+01
Zn-65	1.43E-09	—	—	—	0.00E+00	—	—	4.65E-07	1.58E-07	6.25E-07
Sr-90	2.44E-06	7.30E-02	1.19E-02	7.29E-02	1.24E+00	8.84E-06	9.99E-03	5.76E-03	1.96E-03	1.42E+00
Nb-94	1.23E-01	—	—	—	3.21E-11	—	—	2.25E-10	7.66E-11	1.23E-01
Tc-99	1.34E-04	—	—	—	2.36E-05	—	—	1.60E-02	5.43E-03	2.15E-02
Ru-103	0.00E+00	—	—	—	0.00E+00	—	—	0.00E+00	0.00E+00	0.00E+00
Ru-106	9.17E-12	—	—	—	3.18E-09	—	—	1.09E-07	3.69E-08	1.49E-07
Ag-108m	8.61E-04	—	—	—	1.25E-10	—	—	1.82E-14	6.18E-15	8.61E-04
Ag-110m	2.67E-09	—	—	—	1.47E-13	—	—	4.03E-05	1.37E-05	5.39E-05
Sb-125	4.03E-04	—	—	—	9.03E-04	—	—	1.73E-04	5.88E-05	1.54E-03
I-129	2.20E-11	—	—	—	3.28E-06	—	—	1.94E-03	6.61E-04	2.61E-03
Cs-134	7.72E-05	—	—	—	2.51E-04	—	—	2.22E-03	7.55E-04	3.30E-03
Cs-137	2.81E-06	8.29E+00	1.36E+00	8.28E+00	7.13E+00	1.01E-03	1.14E+00	6.11E-01	2.08E-01	2.70E+01
Ce-144	9.13E-13	—	—	—	3.22E-11	—	—	1.25E-08	4.24E-09	1.67E-08
Eu-152	1.01E-02	—	—	—	5.04E-04	—	—	4.86E-04	1.65E-04	1.13E-02
Eu-154	8.95E-04	—	—	—	6.82E-03	—	—	5.21E-05	1.77E-05	7.78E-03
Pb-210	9.28E-13	—	—	—	2.59E-09	—	—	1.96E-08	6.67E-09	2.89E-08
Ra-226	3.50E-12	—	—	—	2.62E-09	—	—	9.26E-08	3.15E-08	1.27E-07
Ac-227	4.55E-10	—	—	—	2.01E-08	—	—	5.69E-07	1.93E-07	7.83E-07
Th-228	2.70E-07	—	—	—	3.36E-09	—	—	1.34E-08	4.56E-09	2.91E-07

Table 1. (continued).

Isotope	Core Internals	Piping and Tanks—Internal	Piping and Tanks—External	Building and Cubicle Walls—Total	Cubicle 10 Resin Beds	Cubicle 10 Hotspots	Cubicle 13 Hotspots	Second Basement Resin Bed Pair	Hot/Warm Waste Room Resin Bed	All Sources (Total)
Th-229	3.27E-10	—	—	—	1.45E-13	—	—	7.48E-13	2.54E-13	3.28E-10
Th-230	5.02E-10	—	—	—	1.51E-07	—	—	1.25E-07	4.25E-08	3.19E-07
Th-232	2.79E-07	—	—	—	8.56E-16	—	—	6.08E-15	2.07E-15	2.79E-07
Pa-231	4.55E-10	—	—	—	1.91E-08	—	—	1.86E-06	6.33E-07	2.51E-06
U-232	5.12E-10	—	—	—	4.78E-09	—	—	1.31E-08	4.44E-09	2.28E-08
U-233	1.50E-07	—	—	—	6.43E-11	—	—	3.26E-10	1.11E-10	1.51E-07
U-234	1.72E-06	—	—	—	8.11E-04	—	—	5.34E-06	1.82E-06	8.20E-04
U-235	7.82E-08	—	—	—	3.66E-05	—	—	9.72E-07	3.30E-07	3.80E-05
U-236	3.74E-11	—	—	—	7.77E-07	—	—	5.03E-06	1.71E-06	7.52E-06
U-238	1.70E-06	—	—	—	1.06E-05	—	—	2.85E-05	9.68E-06	5.04E-05
Np-237	2.53E-11	—	—	—	1.18E-07	—	—	4.67E-08	1.59E-08	1.80E-07
Pu-238	4.09E-10	—	—	—	7.58E-05	—	—	4.16E-06	1.42E-06	8.14E-05
Pu-239	4.49E-07	—	—	—	3.79E-04	—	—	1.91E-05	6.49E-06	4.05E-04
Pu-240	3.15E-09	—	—	—	1.10E-04	—	—	1.91E-05	6.49E-06	1.36E-04
Pu-241	4.01E-09	—	—	—	1.45E-03	—	—	5.13E-09	1.74E-09	1.45E-03
Pu-242	3.12E-16	—	—	—	8.47E-09	—	—	2.62E-17	8.93E-18	8.47E-09
Pu-244	1.08E-27	—	—	—	1.84E-17	—	—	2.55E-33	8.67E-34	1.84E-17
Am-241	2.25E-10	—	—	—	9.58E-03	—	—	5.90E-06	2.01E-06	9.59E-03
Am-243	1.36E-17	—	—	—	4.32E-07	—	—	3.73E-20	1.27E-20	4.32E-07
Cm-243	1.81E-17	—	—	—	2.34E-07	—	—	0.00E+00	0.00E+00	2.34E-07
Cm-244	4.65E-18	—	—	—	1.25E-06	—	—	2.83E-23	9.64E-24	1.25E-06
Cm-245	5.51E-24	—	—	—	4.92E-11	—	—	0.00E+00	0.00E+00	4.92E-11
Cm-246	2.44E-27	—	—	—	9.41E-13	—	—	0.00E+00	0.00E+00	9.41E-13
Cm-247	3.65E-35	—	—	—	2.67E-19	—	—	0.00E+00	0.00E+00	2.67E-19
Cm-248	2.54E-37	—	—	—	5.89E-20	—	—	0.00E+00	0.00E+00	5.89E-20
Totals	7.79E+01	8.36E+00	1.37E+00	8.35E+00	8.39E+00	1.01E-03	1.14E+00	6.63E-01	2.25E-01	1.064E+02

Most of the radioisotope inventory is embedded in the activated structures inside the reactor vessel. Notable among these is the IPT that housed the experiments. It was located along the centerline of the core and had an estimated activity of 56 Ci. Of that, 43 Ci is Ni-63 and 12 Ci is Co-60. The rest of the reactor structures contain an aggregate of 22 Ci for a total of 78 Ci in the activated material. The structures other than the IPT contain activation products, mostly from Type 304 stainless steel. The greatest of these is 14 Ci of Co-60. The next, most significant part of the radionuclide inventory is 9 Ci residing in resin beds located in Cubicle 10. The resins beds were used to clean the experiment coolant loop, removing the fission fragments and actinides lost to the loop coolant when test rods failed. Most of the radionuclide inventory in the resin beds results from Cs-137, but isotopes with long half-lives also are present. Prefilters and strainers prevented particles and fragmented pieces of the test rods from entering the resin column and passing through the system.

Activity in the remainder of the piping and tank systems is 8 Ci. Least in significance is the contamination on exposed surfaces of structures. Aggregate surface contamination on walls and pipe external surfaces accounts for 11 Ci. It is effectively all Cs-137. The 50% uncertainty of the radiological inventory is based on a combination of factors identified in Section 7 of EDF-4697, "Radiological Characterization of the PBF Reactor for Disposal."

2.4.3 Remaining Nonradionuclide Inventory

The estimated nonradionuclide inventory for PER-620 is documented in EDF-4943, "Nonradiological Inventory of Materials and Components in Subgrade Basement Levels/Areas of the Power Burst Facility Reactor Building (PER-620)." The inventory estimates are listed in Table 2.

Table 2. Power Burst Facility reactor building (PER-620) nonradionuclide estimated inventory.

Potential Contaminant	(kg)	(lb)
Aluminum	2,041	4,490
Boron	164	361
Cadmium	67	147
Chromium[a]	21,750	47,850
Lead	146,637	322,600
Manganese[a]	2,172	4,778
Nickel[a]	11,070	24,350
Selenium	0.03	0.07
Uranium (combined U-238 and U-235 isotopes)[b]	1.109	2.44
Zinc	454	999

a. Chromium, manganese, and nickel are associated with stainless-steel piping, tanks, and other materials.
b. The estimated inventory for metallic uranium is about three times as large as the combined U-235 and U-238 inventory estimates.

The "Nonradiological Inventory of Materials and Components in Subgrade Basement Levels/Areas of the Power Burst Facility Reactor Building (PER-620)" (EDF-4943) presents the nonradiological inventory estimated for the building substructure after ongoing deactivation activities at the facility have been completed. The EDF contains a general description of nonradiological items that could pose a risk to human health and the environment, their location and use in the facility, physical form, and shape.

Estimates were based on discussions with PBF operators, review of drawings and photographs, and evaluation of other supporting documentation. There are 322,200 lb of lead in the subgrade portions of PER-620 and 147 lb of cadmium-containing plates associated with the Fission Product Detection System in Cubicle 13.

Asbestos was used in utility piping insulation (often referred to as thermal system insulation) in the two basement levels. Asbestos is located on piping within the process areas, piping in Loop Cubicles 10 and 13, and in the knockout drum room, annulus, and other subgrade basement areas. The asbestos used in these areas is friable asbestos, as defined in 40 *Code of Federal Regulations* (CFR) 61, "National Emission Standards for Hazardous Air Pollutants." The total amount of friable asbestos in the basement areas includes 969 linear ft of pipe insulation and mudded joints, 415 ft^2 of tank insulation, and 185 ft^2 of fire doors. Nonfriable asbestos includes 24 ft^2 of transite, 5 linear ft of caulking, and 16 ft^2 of countertops. Asbestos is also present in the abovegrade structure.

2.5 Risk Assessment

A streamlined risk assessment was prepared that utilizes the results of the radiological and nonradiological characterization evaluations just described; it is presented in EDF-4869, "Groundwater Pathway Risk Assessment for the PBF Closure." This risk assessment was prepared to assist in the evaluation of alternatives for the final decommissioning of PER-620. This first phase of decommissioning does not contemplate the final end state for the building. Since any residual contamination that may remain following Phase 1 would be addressed in a future action, the results of the evaluation merely allow for diligent consideration of potential environmental impacts from the activities undertaken in Phase 1. In addition, completion of the evaluation at this time allows for a more responsive development of the range of alternatives for the future final phase of decommissioning. The approach taken was to evaluate a worst-case scenario where the maximum mass of contaminants would be left in place. If the worst case could be shown to be protective of the groundwater pathway, then it could be assumed that other alternatives also would be protective.

Based on this streamlined risk assessment, leaving all current source inventory in place results in predicted groundwater concentrations that meet the required performance criteria. For groundwater, the performance criteria are to prevent migration of contaminants from PER-620 that would cause the Snake River Plain Aquifer to exceed a cumulative carcinogenic risk level of 1×10^{-4}, a total hazard index of one, or applicable State of Idaho groundwater quality standards in 2095 and beyond.

From a cumulative risk standpoint, this streamlined risk assessment demonstrates that leaving contaminants in place in the PER-620 substructure would result in an insignificant contribution to the cumulative risk at Operable Unit 5-12. The concentrations of contaminants predicted in the future in the aquifer, as a result of leaving PER-620 contaminants in place, are orders of magnitude below the risk-based concentrations corresponding to the remedial action objectives defined in the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000).

However, removal of material proposed under the first phase of decommissioning at PER-620 would achieve a significant reduction in the amount of waste left remaining in the PBF area. Removing the contaminated water in the reactor vessel and primary coolant loop will eliminate a source of water to the building as an agent for potential leakage while also reducing the potential to mobilize contaminants of concern. Weatherproofing and closing openings to the building will prevent infiltration of precipitation and animal intrusion to the facility. Moisture monitoring sensors would also be installed to ensure that the facility remains dry. These actions would reduce the possibility for future spread of contamination and would meet regulatory requirements for waste management. This first phase of the PER-620 decommissioning will address those activities that may be completed prior to the contract end date for the

ICP and will allow cleanup activities to continue while the transition is completed. These actions supplement the work already performed under the spent fuel removal and initial decommissioning projects where other radioactive and hazardous substances were removed from the building. The actions also supplement those activities that will occur during the final decommissioning of PER-620. In addition, removal of material proposed under the first phase of decommissioning would reduce overall surveillance and maintenance costs at the facility.

3. IDENTIFICATION OF REMOVAL OBJECTIVES AND SCOPE

This section identifies the removal action goals for the activities associated with this removal action.

3.1 Removal Action Objectives

The removal action objectives for this non-time critical removal action are to initiate the first phase of decommissioning to achieve the following:

- Reduce the threat of a future liquid release to the environment by disposing of the reactor vessel water, primary coolant loop water, and other radioactively contaminated water in storage.

- Inhibit direct exposure to radionuclide contaminants of concern remaining at PER-620 that would result in a total excess cancer risk greater than or equal to 1 in 10,000 for future residents and for current and future workers.

- Inhibit dermal adsorption of contaminants of concern remaining at the PBF reactor that would result in a total excess cancer risk greater than or equal to 1 in 10,000 or a hazard index of two or greater for future residents and for current and future workers.

- Prevent migration of contaminants from PER-620 to the environment. Risk analysis indicates that residual contamination at PER-620 would not cause the Snake River Plain Aquifer groundwater to exceed a cumulative carcinogenic risk level of 1×10^{-4}, a total hazard index of one, or applicable State of Idaho groundwater quality standards in 2095 and beyond. However, this removal action objective is retained to demonstrate consistency with the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000).

Although PER-620 is not specifically addressed in the *Record of Decision Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000), these removal action goals are consistent with the remedial action objectives for contaminated soil established in the Record of Decision. The removal action goals also are predicated on the current and future land uses established for the PBF area in the Record of Decision, which include industrial land use until at least 2095 and possible residential land use thereafter. Actions conducted under this non-time-critical removal action would be reviewed with DEQ and EPA for continued protectiveness during the CERCLA 5-year reviews of the remedy for Operable Unit 5-12.

4. IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Two alternatives are identified for this first phase of decommissioning for the PBF reactor building. Alternative 1 (No Action) is to take no action at this time, while Alternative 2 consists of material removal activities and performing work that will prepare the facility for subsequent final decommissioning activities.

4.1 Description of Removal Action Alternatives

4.1.1 Alternative 1—No Action (Continued Surveillance and Maintenance)

The No Action alternative provides a baseline against which impacts of the other alternative can be compared. Under the No Action alternative, the first phase of decommissioning PER-620 would not be taken at this time, but the current surveillance and maintenance activities and other preparatory activities described in Section 2.3.1 would continue. The PBF reactor building would remain as it currently exists until decommissioning of PER-620 would be implemented at a later date.

The No Action alternative requires the continuation of ongoing surveillance and maintenance activities required at an operating facility. At PBF, these include operational surveillances of alarms, chemical storage, safety equipment, and logkeeping; radiological surveillances of radiological instruments, storage areas, and dosimetry; preventive maintenance of utilities, equipment, and instrumentation; calibrations of systems and instrumentation; electricity; and administrative personnel and equipment. Annual costs for these activities are currently estimated to be approximately $480,000 per year.

This alternative makes no progress toward the final decommissioning of PER-620 and is therefore inconsistent with the removal action objectives. Alternative 1 offers no reduction in toxicity, mobility, or volume of contaminants. The alternative does not reduce the annual surveillance and maintenance costs for PER-620.

4.1.2 Alternative 2—Remove Water in Tanks and Reactor Vessel; Remove Most Shielding Lead and Cadmium; Remove Inpile Tube; Weatherproof Building

Alternative 2 would initiate the first phase of decommissioning for PER-620 and place the building in an interim condition until a subsequent phase of decommissioning can be completed by the new ICP. This alternative dispositions contaminated liquids, dispositions most of the lead, dispositions the IPT, and includes the necessary weatherproofing of the PER-620 facility to ensure that PER-620 is secured until the final decommissioning approach is determined. Disposition of the remainder of PER-620 is expected to be completed by the ICP no later than 2012.

Phase 2 final decommissioning activities and establishment of any potential monitoring or institutional controls for the remaining portions of PER-620 are expected to be complete by the end of 2012 under the new ICP contract. These activities are expected to occur under a subsequent action that will also provide opportunity for stakeholder involvement. None of the proposed Phase 1 activities would impact or reduce the full range of options for the ultimate dispositioning of PER-620 during Phase 2.

Alternative 2 would include the disposal of low-level radioactively contaminated water from the PBF reactor vessel, primary coolant loop, and liquid in the PER-706 evaporation tank. The liquids would be removed and disposed of at the ICDF evaporation ponds or other licensed disposal facility, depending on availability and waste acceptance criteria. Alternatively, sufficient capacity exists in the PER-706 evaporation tank to allow the liquids to evaporate in the tank. Water in the reactor vessel currently provides shielding from ionizing radiation from the vessel. Shielding will be placed over the reactor following removal of the reactor vessel water or the reactor vessel will be filled with an inert, solid shielding material.

Alternative 2 would include removal of approximately 213,800 lb of lead (excluding the lead present in Cubicle 10), 147 lb of cadmium, and the IPT. The IPT would be packaged in a fabricated shielding container and would be disposed of at the ICDF or an appropriate off-INEEL disposal facility, such as the Radioactive Waste Management Site at the Nevada Test Site. Removal of the IPT will be most easily accomplished while water remains in the reactor vessel and the overhead crane is available. Therefore, removal of the IPT likely will be one of the first tasks to be completed under Alternative 2. Removed lead that cannot be recycled or reclaimed shall be declared a hazardous waste or mixed low-level waste and will be disposed of at an appropriate off-INEEL RCRA disposal facility, such as Envirocare of Utah. Likewise, the cadmium sheeting will be disposed of at an off-INEEL facility. The lead and cadmium will be stored in RCRA compliant storage prior to disposal. Any other non-HWMA/RCRA waste generated incidental to completing the scope of Alternative 2 that is not otherwise designated for a specific disposal facility in this document will be disposed of in accordance with prevailing waste acceptance criteria for on-INEEL or off-INEEL facilities.

In addition, removal and disposal of some radioactive hotspots may be necessary to reduce worker exposure during removal of shielding lead. Any such incidental radioactive material removed would be disposed of at the INEEL CERCLA Disposal Facility (ICDF). Temporary shielding may be utilized to reduce worker exposure during lead removal and disposal operations.

Alternative 2 would include isolation of utility lines and other piping to the building and weatherproofing openings and penetrations into the PBF reactor building. Remote moisture sensors would be installed in the building and would indicate moisture accumulation in the building. The building will be placed in a cold, dark, and dry condition following completion of Phase 1. Placing the facility in this condition would eliminate the need to perform routine surveillance and maintenance of the facility. Surveillance and maintenance costs would be reduced to approximately $15,000 annually. Annual inspections of the facility would occur until final decommissioning activities commence.

5. ALTERNATIVE ANALYSIS

In accordance with the *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA 1993), the EE/CA for non-time-critical removal action alternatives will be evaluated with respect to three criterion: effectiveness, implementability, and cost.

Effectiveness includes protectiveness and the ability to meet the removal action objectives. Effectiveness was evaluated based on (1) protectiveness of the alternative for public health and the community, (2) protectiveness of workers during implementation, (3) protectiveness of the environment, and, (4) compliance with applicable or relevant and appropriate requirements (ARARs) and other requirements. Ability to achieve removal objectives was evaluated based on (1) level of treatment/containment expected, (2) no residual effect concerns, and (3) maintaining control until a long-term solution is implemented.

Implementability is evaluated based on technical feasibility; availability of equipment, personnel, services, and disposal facilities; and administrative feasibility.

Costs were estimated, including capital costs, operations and maintenance costs, and present net worth costs. The cost estimate is based upon performing the work during the current fiscal year.

5.1 Protectiveness of Workers, Public Health, and the Environment

Consideration of the effectiveness, implementability, and cost criteria for the alternatives is discussed in this section.

5.1.1 Worker Exposure Criteria

Controlling worker exposure during surveillance and maintenance and/or cleanup activities is based on (1) the current ICP administrative control levels for worker radiation exposure (<700 mrem per year), (2) the goal of avoiding any significant increase in craft labor solely for the purpose of distributing estimated radiation exposures among more workers, and (3) the mandate that work be performed in accordance with the ICP radiation protection standards, the as-low-as reasonably achievable (ALARA) radiation exposure standard, and Integrated Safety Management System practices and guidelines.

Optimization techniques are utilized to ensure that worker radiation exposure is ALARA in accordance with 10 CFR 835, "Occupational Radiation Protection," and Integrated Safety Management System practices and guidelines. Evaluation of alternatives in the area of radiation protection includes meeting the requirements of DOE Order 5400.5, "Radiation Protection of the Public and the Environment." In addition, worker radiation exposure is considered on a sitewide collective basis, since overall exposure to the worker population must be addressed relative to administrative control levels.

To accomplish the DOE-ID objective of maintaining individual received radiation doses well below regulatory limits (as defined in 10 CFR 835) and to administratively control and help reduce individual and collective radiation doses, rigorous numerical administrative control levels are established that are below the regulatory limits. These control levels are multitiered with increasing levels of authority required to approve higher administrative control levels. No individual is allowed to exceed the administrative control level without the prior written approval of the facility/project Radiological Control organization, the cognizant facility management, and the INEEL Radiological Control director.

The "Occupational Radiation Protection" regulation (10 CFR 835) requires the INEEL to develop and implement plans and measures to maintain occupational radiation exposures at ALARA levels (10 CFR 835.101[c] and 10 CFR 835.1001). As applied to occupational radiation exposure, the INEEL ALARA process does not require that exposures to radiological hazards be minimized without further consideration, but that such exposures be optimized by taking into account (1) the benefits arising out of the activity, (2) the detriments arising from the resultant radiation exposures, and (3) the controls to be implemented.

An effective ALARA process includes consideration, planning, and implementation of both physical design features (including engineering controls) and administrative controls in order to balance the risks of occupational radiation exposure against the benefits arising out of the authorized activity.

The primary methods used to maintain exposures at ALARA levels are facility and equipment physical design features (see 10 CFR 835.1001[a]). Performance of certain activities such as facility decommissioning could render permanently installed physical design features inadequate. In such instances, engineering controls (e.g., temporary shielding, containment devices, and filtered ventilation systems) are used (as appropriate) to control individual exposures to radiation.

When physical design features (including engineering controls) are impractical or inadequate, the basis should be documented and the work shall be augmented by administrative controls (see 10 CFR 835.1001[a] and [b]).

5.1.2 Other Worker Risks

The ICP must perform work to eliminate excess facilities at the INEEL and reduce the risks to the environment, while performing the work safely. The following discussion outlines the risks to employees that might be encountered during decommissioning of PER-620 and risk mitigation criteria.

5.1.2.1 Lead Brick Handling.
The manual or automated handling of lead bricks could cause airborne concentrations of lead to exceed the Occupational Safety and Health Administration permissible exposure limit of 50 $\mu g/m^3$ of air for an 8-hour day. Additional protection measures applicable to this effort are routine air sampling, biological monitoring of the lead worker cadre on a quarterly basis, and four changes of PPE per worker per day. Historical worker exposures for handling large quantities of lead bricks would indicate the selection of a powered air-purifying respirator as the respirator of choice, especially where oxidation of bricks and sheeting is a factor in exposure, which is the case at PBF. Without air-purifying respirators, manual handling could result in overexposure to lead. The removal strategy also requires showering of workers and separate laundering of PPE and separate change areas and eating facilities. Additional considerations include the safety hazards of finger, hand, and other injuries, which can occur during handling of lead bricks, entry into confined spaces, and physical stress from carrying heavy—and in some cases ungainly—lead bricks to a collection point because of inaccessibility of the current location where the bricks have been used.

Surface oxidation is the predominant mechanism under which the corrosion of lead brick and sheet occurs in an oxygenated atmosphere. Oxidized lead can become airborne and constitutes an inhalation hazard unless appropriate respiratory protection is used.

5.1.2.2 Ergonomics.
The average weight of the ordinary lead brick is approximately 28 lb. The manual labor required to move, survey, package, and ship this material would expose the workforce to an increased risk of musculoskeletal injuries. Back, shoulder, and extremities are the susceptible body regions for this type of injury. Based on projected exposures at the PBF site, and past actuarial data from the INEEL and other DOE laboratories, this category of injury would be the most frequent risk of serious injury with long-term effects to the workforce.

5.1.2.3 Heat-Related Disorders.
Work performed in removing lead, activated components, and other radiological and hazardous material abatement requires the use of multiple forms of PPE. The wearing of PPE to shield workers from the ambient environment interferes with normal body-temperature control mechanisms (such as sweating) and thus increases the risk of heat-related illnesses and injuries, especially when used in multiple layers while engaged in heavy work, as this effort would require. The hazard of heat-related disorders to employees is the second most frequently occurring serious risk to employees engaged in this work.

5.1.2.4 Employee Empowerment.
It is the responsibility of every INEEL employee to stop work if the worker feels exposed to an uncontrolled or unacceptable hazard. Every INEEL employee has the right to stop work until hazards are mitigated and the work can be performed safely.

5.1.3 Effectiveness of the Alternatives

The two subcriteria for evaluating effectiveness are protectiveness and the ability to meet the removal action objectives.

5.1.3.1 Protectiveness.
Alternative 1 would remain protective of public health, the community and the environment because ongoing surveillance and maintenance activities for PER-620 would be continued until a future decommissioning effort is undertaken for the facility. These activities include operational surveillances of alarms, chemical storage, safety equipment, and logkeeping; radiological surveillances of instruments, storage areas, and dosimetry; preventive maintenance of utilities, equipment, and instrumentation; and calibration of systems and instrumentation.

Alternative 2 would also be protective of public health, the community, and the environment when the removal action has been completed, because the contaminants present in PER-620 and PER-706 (which are addressed under the scope of Phase 1 of the decommissioning) would be removed and disposed of at an appropriate disposal facility. The remaining hazardous materials (both radiological and chemical) will be placed in a cold, dark, and dry condition and contaminants present in the PBF reactor building would be isolated through the weatherproofing of any openings to the building. In addition, measures would be taken that would prevent infiltration of rainwater and snowmelt through the structure and thereby inhibit any future potential migration of contaminants to the environment. Remote moisture sensing equipment will alarm if any water enters the building. Final decommissioning is scheduled to occur before 2012 under the next ICP contract. In addition, removal of approximately 213,800 lb of lead and 147 lb of cadmium and an estimated 56.2 Ci of radionuclides with the IPT will meet HMWA/RCRA hazardous waste requirements and contribute to a net contamination footprint reduction at the INEEL. The risk assessment in Section 2.5 demonstrates that leaving contaminants in place in the building substructure would not pose unacceptable risk through the groundwater exposure pathway nor would it cause the Idaho Ground Water Quality standards (maximum contaminant levels) to be exceeded. During the removal action, the action would be protective of health, the community, and the environment through the use of active engineering controls. Although protective, Alternative 2 is a temporary action that would require additional action at a later date to place the PBF reactor building in a final, protective configuration.

Worker exposure during implementation of Alternative 2 was estimated by examining the specific individual activities involved in accomplishing the overall tasks and objectives, determining estimated times in which work would be performed in locations with radiation exposure fields, estimating crew sizes, determining overall estimated hours for work to be performed, and using estimated radiation exposure rates based on current facility information and surveys. Worker radiation exposure for this alternative was estimated to be approximately 8 person-rem. However, the estimates are based upon current understanding of the sources in PER-620. Conditions concealed behind shielding, walls, or other structures may include unexpected radiological source terms, obstructions, or physical conditions. Consistent with ALARA principles, every effort would be made to minimize worker radiation exposure.

5.1.3.2 Ability to Achieve Removal Action Objectives. Removal action objectives are not met under Alternative 1 since the liquids present in PER-620 are not removed and no progress is made toward the final decommissioning of the facility. Continuing existing surveillance and monitoring activities only delays the eventual decommissioning of PER-620.

Removal action objectives are met under Alternative 2 by weatherproofing the PBF reactor building from the weather and animal intrusion and removing most of the shielding lead, the cadmium sheeting, the IPT, and water consolidated in the PER-706 evaporation tank. The risk assessment (Section 2.5) demonstrates that the residual contaminant source would not cause the Snake River Plain Aquifer to exceed the Idaho groundwater quality standards in the future. The Phase 1 decommissioning of PER-620 would not be the final action for the PBF reactor building. A subsequent action will be necessary to disposition remaining material in the building.

5.1.4 Implementability of the Alternatives

5.1.4.1 Technical Feasibility. Alternative 1 consists of the continuation of existing surveillance and maintenance activities and is therefore feasible to continue.

Alternative 2 would be technically feasible. The methods used to weatherproof the PBF reactor building are standard. Disposal or recycling facilities are available for all waste generated, including the reactor vessel water, PER-706 water, the IPT, cadmium, and lead. Since the objective of the non-time-critical removal action for the first phase of decommissioning PER-620 is to accomplish as much work as possible prior to May 2005, Alternative 2 would rely on technology and equipment that are commercially available or readily available at a reasonable cost and delivery schedule.

Equipment that may be employed to substantially reduce worker risks may also include remote equipment such as lifts to remove the lead out through the ceiling hatches or a remotely operated front-end loader or fork lift to remove the lead through an exterior door that would be cut into the north wall of the first basement. Additional remote equipment for size reduction or packaging also may be utilized.

The IPT is currently stored in a support stand mounted in the PBF reactor vessel. Since the IPT contains a relatively high level of activated material, the feasibility of the removal and disposal of the IPT has been evaluated. The steps planned include (1) constructing a shielded container for transportation and disposal/storage, (2) rigging the IPT, (3) draining and placing the IPT in the shielded container, (4) transporting it to the disposal/storage location, and (5) placing it in the disposal/storage location.

The IPT would require a shielded container for shipping and disposal purposes to reduce the exterior radiation levels to acceptable levels. The 75-ton overhead crane would be used to lift the IPT and place it in the shipping and disposal container. Since the IPT is highly activated and the radiation level measure 1 in. from the IPT is as high as 89 rem/hour, employees would be kept as far away as possible and shielding would be used to minimize personnel exposure.

5.1.4.2 Availability of Alternatives. Alternative 1 consists of the continuation of existing surveillance and maintenance activities, and would continue to be available.

Alternative 2 has few constraints with respect to availability. The equipment necessary to implement the removal action is commercially available or is currently available at the INEEL. Personnel and services also would be available, although the project might compete with other INEEL projects for resources. Laboratory testing capabilities exist on-Site and would be available for this alternative. The materials and equipment for weatherproofing the PBF reactor building are readily available to the INEEL. On-INEEL or off-INEEL disposal or recycling facilities are available for all waste generated, including the PER-706 water, the IPT, cadmium sheeting, and the lead shielding

5.1.5 Cost of the Alternatives

The estimated cost to implement Alternative 2 is approximately $5.9 million. Since the work is scheduled to be performed in this fiscal year, very little cost escalation applies to the estimates, and the net present value cost is the same. The capital costs include costs for the isolations, deactivation, removal of some shielding lead, removal of contaminated water, removal of the IPT, placement of a shield over the reactor vessel, weatherproofing the building, and waste disposal.

Annual surveillance and maintenance costs at PER-620 are approximately $480,000. These costs are expected to continue until final decommissioning of PER-620 can be completed (currently scheduled for completion prior to 2012). Implementing Alternative 2 is expected to reduce annual surveillance and maintenance costs for the facility to approximately $15,000 per year. If the final decommissioning were not initiated for another 7 years, implementing Alternative 2 would result in a cost avoidance of other surveillance and maintenance costs of approximately $3.241 million.

Although protective, Alternative 2 is a temporary action that would require additional action at a later date to place the PBF reactor building in a final, protective configuration. These future costs are not included in the estimate. Table 3 shows the cost estimates for No Action and Removal Action alternatives.

Table 3. Cost estimates for No Action and Removal Action alternatives.

Cost Element	No Action Alternative ($)	Removal Action Alternative ($)
Engineering, construction, and waste management	—	5,761K
Surveillance and maintenance	3,346K[a]	105K[b]
Total (net present value)	3,346K	5,866K

a. The surveillance and maintenance costs are estimated at $478K annually and are the total over the next 7 years, until final decommissioning is accomplished under the Idaho Completion Project.
b. The surveillance and maintenance costs following Phase 1 of the decommissioning are estimated at approximately $15K annually.

5.1.6 Evaluation Summary

Both alternatives are effective and protective relative to the defined public health and community, environment, worker, and ARAR compliance effectiveness criteria. Alternative 2 meets remedial action objectives, but Alternative 1 does not, because it does not remove liquids from PER-620 and does not make progress toward final decommissioning. Both alternatives are considered to be implementable. Alternative 2 is more cost effective and addresses those activities that may be completed prior to the scheduled separation date for the ICP and INL and will allow cleanup activities to continue while the transition is completed, while reducing overall surveillance and maintenance costs at the facility. Table 4 shows the Alternative 2 inventory to be addressed under the non-time-critical removal action before May 1, 2005.

Table 4. Alternative 2 inventory to be addressed under the removal action before May 1, 2005.

Material	Estimated Inventory	Breakdown of Phased Work	
		Phase 1	Future Phase
RADIONUCLIDE INVENTORY			
Activated materials			
Inpile tube	56 Ci	56 Ci	
Reactor vessel	22 Ci		22 Ci
Contaminated resin beds			
Out-of-service loop cleanup resins in Cubicle 10	<8 Ci		<8 Ci
Canal cleanup warm waste room	1 Ci		1 Ci
In-service canal cleanup resins, I	<1 Ci		<1 Ci
Out-of-service canal cleanup resins, II	<1 Ci		<1 Ci
Surface contamination	13 Ci		13 Ci
Miscellaneous contamination	4 Ci		4 Ci

Table 4. (continued).

Material	Estimated Inventory	Breakdown of Phased Work	
		Phase 1	Future Phase
NONRADIONUCLIDE INVENTORY			
Shielding lead (lb)			
Cubicle 13			
Blowdown tank	113,000	113,000	
Fission Product Detection System cave	66,300	66,300	
Lead panels	10,300	10,300	
Other	2,900	2,900	
Subtotal	192,500	192,500	
Cubicle 10			
Loop cleanup resin columns			
Outer block course	24,650		24,650
Inner block course	24,650		24,650
Loop strainer	54,400		54,400
Other	4,700		4,700
Subtotal	108,400		108,400
Reactor annulus	2,700	2,700	
Sample room	7,600	7,600	
Other areas	11,000	11,000	
Subtotal	21,300	21,300	
Total shielding lead (lb)	322,200	213,800	108,400
Total radioactive materials (Ci)	<106 Ci	56 Ci	<50 Ci

a. Estimates are based on current information and may change based on concealed or new conditions occurring during the actual removal operations.

6. RECOMMENDED REMOVAL ACTION ALTERNATIVE

The DOE-ID recommends implementation of Alternative 2. The recommended alternative meets the proposed removal action objectives regarding long-term risk, minimizes short-term worker risk and radiation exposure, is cost effective, and provides a safe and stable configuration that is environmentally sound. The alternative may be implemented prior to the ICP contract end date and allows the DOE-ID to continue making progress toward the completion closure actions at the PBF area site, which will allow the ICP and INL to focus on other cleanup, closure, and new mission activities. The DOE-ID also considers Alternative 2 consistent with the remedial action objectives of the Record of Decision (DOE-ID 2000) and compliant with ARARs. Alternative 1 is not preferred because it makes no progress toward the final decommissioning of PER-620 and is therefore inconsistent with the removal action objectives and because it offers no commensurate risk reduction benefit to human health and the environment.

6.1 Compliance with Environmental Regulations, Including Those that are Applicable or Relevant and Appropriate Requirements

Section 121 of CERCLA (42 USC § 9621) requires the responsible CERCLA implementing agency to ensure that the substantive standards of HWMA/RCRA and other applicable laws will be incorporated into the federal agency's design and operation of its long-term remedial actions and into its more immediate removal actions. The DOE-ID is the implementing agency for this non-time-critical removal action. Both the DEQ and the EPA concur that a non-time-critical removal action is warranted to protect human health and the environment. Through the non-time-critical removal action process, the risks presented in this document will be mitigated in a timely manner.

Alternative 2 would result in the management of approximately 213,800 lb of lead and 147 lb of cadmium sheeting (associated with the Cubicle 10 Fission Product Detection System) within the existing subsurface structure at PBF. Low-level radioactively contaminated liquids will require disposition, and the IPT will be disposed of as a special-case radioactive waste.

Table 5 lists the proposed ARARs that have been identified for this removal action. These ARARs are a compilation and expansion of the ARARs identified in the Record of Decision (DOE-ID 2000). The ARARs list is based on several key assumptions:

- Currently, the water in the facility provides shielding for the reactor and activated metals—all with significant radioactivity—as well as radioactive contamination adhering to and/or embedded in the interior canal surfaces.

- Management of CERCLA waste generated during the removal action would be subject to meeting the waste acceptance criteria of the ICDF. This waste will be managed in accordance with the ARARs identified in Table 5.

- If decontamination liquids are generated, they would be handled in the same manner as the contaminated water removed from the PBF reactor vessel, tanks, and piping.

- Debris generated during removal of the lead might have paint that contains PCBs. If encountered, such waste may trigger substantive requirements of the Toxic Substances Control Act (15 USC § 2601 et seq.). Lead-contaminated paint may also be removed during recovery of the shielding lead, which would be subject to the substantive requirements of RCRA hazardous waste regulations. This waste would be disposed of at the ICDF, unless it can be demonstrated that it is eligible for disposal as solid waste at the CFA Landfill Complex. The PCB-containing light ballasts would be removed from the building prior to this removal action under DOE-ID's Deactivation Program.

- Asbestos-containing material may be encountered incidental to removal of the lead. This waste would be subject to specific asbestos regulations and would be acceptable for disposal at the ICDF or, if not radiologically contaminated, at the CFA Landfill Complex. Asbestos remaining in the building after completion of this non-time-critical removal action will be dispositioned in a future action.

Table 5. Summary of applicable or relevant and appropriate requirements for the Power Burst Facility non-time critical removal action.

Requirement (Citation)	ARAR Type	Comments
Clean Air Act and Idaho Air Regulations		
"Toxic Substances," IDAPA 58.01.01.161	A	Applies to any toxic substances emitting during implementation of the removal action.
<10 mrem/yr, 40 CFR 61.92, "Standard"	A	Applies to the waste-handling activities.
"Emission Monitoring and Test Procedures," 40 CFR 61.93	A	Applies to the waste-handling activities.
"Compliance and Reporting," 40 CFR 61.94(a)	A	Applies to the waste-handling activities.
"Standards for Demolition and Renovation," 40 CFR 61.145	A	Applies to any asbestos-containing materials removed during the decommissioning.
"Rules for Control of Fugitive Dust," and "General Rules," IDAPA 58.01.01.650 and .651	A	Applies to the waste-handling activities.
RCRA and Idaho Hazardous Waste Management Act		
Generator Standards:		
"Standards Applicable to Generators of Hazardous Waste," IDAPA 58.01.05.006, and the following, as cited in it:		
"Hazardous Waste Determination," 40 CFR 262.11	A	Applies to waste that would be generated during the removal action.
General Facility Standards:		
IDAPA 58.01.05.008, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," and the following, as cited in it:		
"Temporary Units (TU)," 40 CFR 264.553	A	Waste may be treated or temporarily stored in a temporary unit prior to disposal.
"Staging Piles," 40 CFR 264.554	A	Waste may be temporarily staged prior to disposal.
"General Inspections Requirements," 40 CFR 264.15	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.
"Preparedness and Prevention," 40 CFR 264, Subpart C	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.
"Contingency Plan and Emergency Procedures," 40 CFR 264, Subpart D	A	Applies to a facility staging, storing, or treating hazardous waste prior to transfer to the ICDF or an off-Site facility.
"Disposal or Decontamination of Equipment, Structures, and Soils," 40 CFR 264.114	A	Applies to contaminated equipment used to remove, treat, or transport hazardous waste.
"Use and Management of Containers," 40 CFR 264.171–178	A	Applies to containers used during the removal and treatment of hazardous waste.

Table 5. (continued).

Requirement (Citation)	ARAR Type	Comments
Land Disposal Restrictions:		
IDAPA 58.01.05.011, "Land Disposal Restrictions," and the following, as cited in it:		
"Applicability of Treatment Standards," 40 CFR 268.40(a)(b)(e)	A	Applies to hazardous waste and secondary waste, if treatment is necessary to meet the disposal facility's waste acceptance criteria or if treatment is required before placement.
"Treatment Standards for Hazardous Debris," 40 CFR 268.45	A	Applies to hazardous debris, if treatment is necessary to meet the disposal facility's waste acceptance criteria or if treatment is required before placement.
"Universal Treatment Standards," 40 CFR 268.48(a)	A	Applies to nondebris hazardous waste and secondary waste, if treatment is necessary to meet the disposal facility's waste acceptance criteria or if treatment is required before placement.
"Alternative LDR Treatment Standards for Contaminated Soil," 40 CFR 268.49	A	Applies to contaminated soil, if treatment is necessary to meet the disposal facility's waste acceptance criteria or if treatment is required before placement.
Idaho Groundwater Quality Rules		
"Ground Water Quality Rule," IDAPA 58.01.011	A	The waste-handling activities must prevent migration of contaminants from the PBF reactor that would cause the Snake River Plain Aquifer groundwater to exceed applicable State of Idaho groundwater quality standards in 2095 and beyond.
TSCA		
"Decontamination Standards and Procedures: Decontamination Standards," 40 CFR 761.79(b)(1)	A	Applicable to decontamination of equipment with PCB contamination, if PCB waste is generated.
"Decontamination Standards and Procedures: Self-Implementing Decontamination Procedures," 40 CFR 761.79(c)(1) and (2)	A	Applicable to decontamination of equipment with PCB contamination, if PCB waste is generated.
"Decontamination Standards and Procedures: Decontamination Solvents," 40 CFR 761.79(d)	A	Applicable to decontamination of equipment used to manage PCB-contaminated waste, if PCB waste is generated.
"Decontamination Standards and Procedures: Limitation of Exposure and Control of Releases," 40 CFR 761.79(e)	A	Applicable to decontamination activities of equipment with PCB-contaminated waste, if decontamination is performed.
"Decontamination Standards and Procedures: Decontamination Waste and Residues," 40 CFR 761.79(g)	A	Applicable to management of decontaminated waste and residuals from PCB-contaminated equipment, if PCB waste is generated.
To-Be-Considered Requirements		

Table 5. (continued).

Requirement (Citation)	ARAR Type	Comments
“Radiation Protection of the Public and the Environment,” DOE Order 5400.5, Chapter II(1)(a,b)	TBC	Applies to the PBF reactor building before, during, and after the removal action. Substantive design and construction requirements would be met to keep public exposures as low as reasonably achievable.
“Radioactive Waste Management,” DOE Order 435.1	TBC	Applies to the PBF reactor building before, during, and after the removal action. Substantive design and construction requirements would be met to protect workers.
“Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities,” May 3, 1999 (EPA 1999)	TBC	Applies to residual waste following completion of the removal action.

A = applicable requirement; R = relevant and appropriate requirement; TBC = to be considered
ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = *Code of Federal Regulations*
DOE = U.S. Department of Energy
EPA = U.S. Environmental Protection Agency
ICDF = INEEL CERCLA Disposal Facility
IDAPA = Idaho Administrative Procedures Act
PCB = polychlorinated biphenyl
PBF = Power Burst Facility
RCRA = Resource Conservation and Recovery Act
TBC = to be considered
TSCA = Toxic Substances Control Act

- Lead shielding in various forms would be generated as a potential waste. Removed lead that cannot be recycled or reclaimed shall be declared a hazardous waste or mixed low-level waste and will be disposed of at an appropriate off-INEEL RCRA disposal facility, such as Envirocare of Utah. Likewise, the cadmium sheeting will be disposed of at an off-INEEL facility. The lead and cadmium will be stored in RCRA compliant storage prior to disposal.

- Lead shielding remaining in the building after completion of this non-time-critical removal action will continue to function as radiation shielding during future worker entries, until it is dispositioned in a future action.

- Mercury located in about 100 mercury fluorescent lamps in the basement would be removed prior to this removal action under DOE-ID's Deactivation Program, as would the mercury-containing electrical switches and lights in the abovegrade structure. No mercury is expected to be present in the building substructure at the start of the removal action.

6.2 Compliance with Disposal Facility Waste Acceptance Criteria

6.2.1 INEEL CERCLA Disposal Facility Waste Acceptance Criteria

The ICDF is one option for disposal of the contaminated liquid radioactive waste. The waste acceptance criteria for the ICDF evaporation ponds can be divided into two main components: (1) contaminant-specific concentration or activity limits and (2) limits on the origin of the water. Based on analytical data, the water from the PER-706 evaporation tank is expected to meet the contaminant-specific concentration or activity limits of the ICDF evaporation pond's waste acceptance criteria. The ICDF is the preferred option for the disposal of contaminated solid radioactive waste. The Staging, Storage, Sizing, and Treatment Facility at the ICDF contains a storage/staging building, a waste shredder, solidification/stabilization tanks, and associated equipment to treat the waste to meet all potential waste acceptance criteria prior to disposal. The PBF waste not requiring treatment may be directly disposed of in the landfill cell if it meets the waste acceptance criteria.

6.3 Achieving Removal Action Goals

The recommended Alternative 2 would meet the removal action objectives through dispositioning low-level radioactive liquids from PER-620 (including the water from the reactor vessel and primary coolant loop) and dispositioning liquids in the PER-706 evaporation tank, removing most of the shielding lead and all cadmium sheeting, removing the IPT, and weatherproofing the PBF reactor building. Shielding will be placed over the reactor following removal of the reactor vessel water or the reactor vessel will be filled with an inert, solid shielding material. To reduce worker exposures during removal of shielding lead, removal and disposal of some radioactive hotspots may also be necessary.

Activities that will not be performed under this non-time-critical removal action, include disposition of the PBF reactor vessel, lead shielding and ion-exchange columns in Cubicle 10, and reactor cooling assemblies, piping, and pumps. Final decommissioning activities and establishment of any potential monitoring or institutional controls for the remaining portions of PER-620 are expected to be completed by the end of 2012 under the new ICP. The lead shielding remaining in the building after completion of this non-time-critical removal action will continue to function as radiation shielding during future worker entries, until it is dispositioned in a future action, and will be subject to future removal or postclosure requirements, as applicable. These future activities will need to occur under a subsequent action that will also provide opportunity for stakeholder involvement.

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